CLAIMS

What we claim is:

1. A method of curing concrete utilizing at least one electrically conductive circuit within uncured concrete by energizing the circuit with electrical power to resistively heat the circuit during at least a portion of the time of concrete curing.
2. The method of claim 1 wherein the concrete is heated by the circuit during at least a portion of the time of concrete curing.
3. The method of claim 2 wherein the concrete is heated to a first temperature and then the electrical power controllably modified prior to completion of the curing.
4. The method of claim 3 wherein the amount of electrical power is modified to achieve an intended rate of compressive strength gain of the concrete during cure.
5. The method of claim 1 wherein the circuit is comprised of non-metallic electrically conductive material.
6. The method of claim 1 wherein the circuit is comprised at least partially of carbon.
7. The method of claim 1 wherein the circuit contains carbon fibers.
8. The method of claim 7 wherein the carbon fiber is selected from a group consisting of 2P50K 1P6K, 2P6K, 3KUNI, 6P12KCL and 3P1KTRIAX.
9. The method of claim 7 wherein the carbon fiber is a 12K carbon fiber tow.
10. The method of claim 7 wherein the carbon fiber is a 24K carbon fiber tow.
11. The method of claim 7 wherein the carbon fiber is a 48K carbon fiber tow.
12. The method of claim 7 wherein the carbon fiber is a 80K carbon fiber tow.
13. The method of claim 7 wherein the carbon fiber is a 96K carbon fiber tow.
14. The method of claim 7 wherein the circuit contains thermally responsive filaments commingled with 12K carbon fiber.
15. The method of claim 7 wherein the carbon fiber is coated with a non electrically conductive material.
16. The method of claim 15 wherein the coating is a polymer.
17. The method of claim 15 wherein the coating is a textile.
18. The method of claim 14 wherein the thermally responsive filaments contain nylon 6 and 12K carbon fiber.
19. The method of claim 14 wherein the thermally responsive filaments contain nylon 12 and 12K carbon fiber.

20. The method of claim 14 wherein the thermoplastic fiber is polyethylene and 12K carbon fiber.

21. The method of claim 14 wherein the thermoplastic fiber is polypropylene and l2K carbon fiber.

22. The method of claim 14 wherein the thermoplastic and carbon fiber circuit can be installed in a concrete form, energized with electrical power and prior to the introduction of uncured concrete.

23. The method of claim 7 wherein the circuit contains carbon fiber with a tensile strength of at least 900 MN/m^2.

24. A method of heating concrete by placing an electrically conductive circuit within the concrete prior to curing and placing the circuit in electrical communication with an external power source to resistively heat the circuit.

25. A method of curing concrete comprising:

a) placing at least one electrically conductive circuit within a concrete form;

b) adding uncured concrete into the form;

c) connecting the circuit to an electrical power source to resistively heat the circuit, and

d) using the resistive heat to raise the temperature of the uncured concrete.

26. The method of claim 25 further comprising coated electrically conductive fibers

27. A method of curing concrete containing heat responsive additives comprising energizing electrically conductive circuits within the uncured concrete to resistively heat the circuit within the concrete.

28. The method of claim 25 wherein the concrete contains polymer additives.

29. The method of claim 25 wherein the concrete contains heat responsive additives to activate a hydration reaction by means of an interlaminar heating.

30. A method of controllably initiating the cure of concrete by placement of additives to the uncured concrete and at least one resistively heatable electric circuit that capable of furnishing sufficient heat activation energy for curing.

31. The method of claim 30 wherein the additives are selected from a group consisting of polymers and heat responsive catalysts.

32. A method of heating a concrete surface by utilizing at least one electrically conductive circuit installed within the concrete prior to completion of curing and energizing the circuit with electrical power to resistively heat the circuit.

33. A method of reinforcing concrete by placing an electrically conductive circuit containing fibers with a tensile strength of at least 900 MN/m^2 within the concrete.
34. A concrete structure containing at least one electrically conductive circuit installed prior to the completion of concrete cure.
35. The concrete structure of claim 32 wherein the circuit can be energized after concrete cure.
36. The concrete structure of claim 35 wherein the circuit is resistively heated to increase the temperature of a surface of the structure.
37. The structure of claim 32 wherein the circuit can be energized during the concrete cure.
38. A concrete object comprising:
    a) at least one electrically conductive circuit within the concrete; and
    b) means to connect the circuit to an external electrical power source.
39. The object of claim 38 further containing rebar.
40. The object of claim 39 wherein the circuit is attached to the rebar.
41. The object of claim 40 wherein the attached circuit is electrically isolated from the rebar.
42. The object of claim 38 wherein the circuit is wound around the rebar.
43. The concrete object of claim 38 wherein the electrically conductive circuit is tensioned prior to the placement of uncured concrete.
44. The concrete object of claim 38 wherein the circuit is placed within the object in a manner to supply structural strength.
45. A concrete object comprising:
    a) at least one first surface;
    b) at least one electrically conductive circuit within the concrete;
    c) means to energize the circuit to create resistive heat to elevate the temperature of the first surface.
46. A concrete object containing at least one electrically conductive circuit comprised of braided carbon fibers.
47. The concrete object of claim 46 wherein the braided carbon fibers are oriented at varying angles.
48. The concrete object of claim 46 wherein the circuit comprises multiple layered braided carbon fibers.

49. A concrete structure containing at least one electrically conductive circuit comprising fibers with a thermally responsive resin.

50. The concrete structure of claim 49 further wherein the thermally responsive resin is cured at the time the concrete is cured.

51. A concrete object containing an electrically conducive material that can be connected to an electrical power source for heating.

52. A concrete material containing electrically conductive material that can be connected to an electrical power source to create heat within the concrete structure.

53. The object of claim 52 wherein the electrically conductive material is connected to the electrical power source with a bus bar component.

54 A concrete structure containing an electrical circuit comprised of conductive fibers with a tensile strength of at least 900 MN/m^2.

55. A concrete structure containing an electrical circuit comprised of carbon fibers mechanically wound.

56. A concrete structure containing an electrical circuit comprising consolidated bundles of carbon having a first end and a second end attached at least one buss bar.

57. The buss bar of claim 56 is the electric contact point through which the electric power is driven to generate resistive heat sufficient to activate a hydration reaction within concrete.

58. A concrete structure containing an electrical circuit comprised of carbon fibers mechanically consolidated by weaving.

59. A concrete structure containing an electrical circuit comprised of carbon fibers mechanically consolidated by stitch bonding.

60. A concrete structure containing an electrical circuit comprised of carbon fibers mechanically consolidated by knitting.

61. A concrete structure containing an electrical circuit comprised of carbon fibers mechanically consolidated by braiding.

62. A concrete structure containing at least one electrically conductive circuit installed within the concrete prior to completion of concrete cure and that can be energized after cure to provide radiant heat from the concrete.

63. The structure of claim 38 is a wall.

64. The structure of claim 38 is a floor.

65. The structure of claim 38 is a ceiling.

66. The floor of claim 38 may serve as the heated pouring slab to radially heat the concrete structure formed upon it.

67. The heated pouring slab to cure concrete wails, ceilings, pre-cast parts, pre-cast pipe, and pre-stress beams and decks.